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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/743,130	12/23/2003	Masatoshi Yoshikawa	246945US2SRD	8460

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EXAMINER	
CHEN, TIANJIE	
ART UNIT	**PAPER NUMBER**
2627	

DATE MAILED: 08/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/743,130	YOSHIKAWA ET AL.	
	Examiner	Art Unit	
	Tianjie Chen	2627	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5 and 7-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,5,14,15 and 18* is/are rejected.

7)☒ Claim(s) *3,4,7-13,16,17,19 and 20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Non-Final Rejection

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 2, 5, 15, and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Sakakima et al (US 5,715,121).

Claim 1, 15, and 18 Sakakima et al shows a magnetoresistive element, which is to be used for a magnetic reproducing head for a magnetic reproducing apparatus, which includes: a magnetoresistive film in Fig. 1 including a magnetization pinned layer 3 (Fig. 1; column 3, lines 26-27), a magnetization free layer 1 (Column 3, lines 23-24), and a nonmagnetic intermediate layer 2 (Fig. 1; column 3, line 19), a magnetization direction of the magnetization pinned layer substantially fixed in an external magnetic field, a magnetization direction of the magnetization free layer configured to change in the external magnetic field, the nonmagnetic intermediate layer formed between the magnetization pinned layer and the magnetization free layer and having a stacked structure)Fig. 2A) of a first non-metallic intermediate layer 21/a metal intermediate layer 22/a second non-metallic intermediate layer 21 (Column 3,

lines 44-52 and column 4, lines 13-20); and a pair of electrodes 11 (Column 4, line 3) coupled to the magnetoresistive film and configured to provide a current in a direction substantially perpendicular to a surface of the magnetoresistive film.

Claim 2, Sakakima et al shows that the metal intermediate layer has a thickness in a range of 0.5 nm to 20 nm (Column 7, lines 48-49).

Claim 5, Sakakima et al shows that the metal intermediate layer contains Cu (Column 7, lines 48-50).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sakakima et al in view of Saito et al (US 6,839,206).

Sakakima et al does not show an antiferromagnetic layer formed in contact with the magnetization pinned layer.

Saito et al shows an antiferromagnetic layer formed in contact with the magnetization pinned layer and teaches that the use of antiferromagnetic layer can prevent the magnetization direction of the pinned layer from being changed by an external magnetic field (Column 11, lines 5-11). It is also well known in the art that antiferromagnetic layer is commonly used in the art at the time the invention was made for pinning the pinned layer. One of ordinary skill in the art would have been

motivated to add the antiferromagnetic layer into Sakakima et al' device in order preventing the change of the magnetization direction of the pinned layer.

Allowable Subject Matter

4. Claims 3, 4, 7-13, 16, 17, 19, and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

- With regard to claim 3, 16, and 19; as the closest reference on record, Sakakima et al (US 5m715,121) shows , Sakakima et al shows a magnetoresistive element, which is to be used for a magnetic reproducing head for a magnetic reproducing apparatus, which includes: a magnetoresistive film including a magnetization pinned layer, a magnetization free layer, and a nonmagnetic intermediate layer, the nonmagnetic intermediate layer formed between the magnetization pinned layer and the magnetization free layer and having a stacked structure of a first non-metallic intermediate layer /a metal intermediate layer /a second non-metallic intermediate layer; and a pair of electrodes coupled to the magnetoresistive film and configured to provide a current in a direction substantially perpendicular to a surface of the magnetoresistive film; **but fails to show** a first interface metal layer formed between the magnetization free layer and the first non-metallic intermediate layer.
- With regard to claim 4, 17, and 20; as the closest reference on record, Sakakima et al (US 5m715,121) shows , Sakakima et al shows a magnetoresistive element, which is to be used for a magnetic reproducing head

for a magnetic reproducing apparatus, which includes: a magnetoresistive film including a magnetization pinned layer, a magnetization free layer, and a nonmagnetic intermediate layer, the nonmagnetic intermediate layer formed between the magnetization pinned layer and the magnetization free layer and having a stacked structure of a first non-metallic intermediate layer /a metal intermediate layer /a second non-metallic intermediate layer; and a pair of electrodes coupled to the magnetoresistive film and configured to provide a current in a direction substantially perpendicular to a surface of the magnetoresistive film; **but fails to show** a second interface metal layer formed between the magnetization pinned layer and the second non-metallic intermediate layer.

- With regard to claim 8; as the closest reference on record, Sakakima et al (US 5m715,121) shows , Sakakima et al shows a magnetoresistive element, which is to be used for a magnetic reproducing head for a magnetic reproducing apparatus, which includes: a magnetoresistive film including a magnetization pinned layer, a magnetization free layer, and a nonmagnetic intermediate layer, the nonmagnetic intermediate layer formed between the magnetization pinned layer and the magnetization free layer and having a stacked structure of a first non-metallic intermediate layer /a metal intermediate layer /a second non-metallic intermediate layer; and a pair of electrodes coupled to the magnetoresistive film and configured to provide a current in a direction substantially perpendicular to a surface of the magnetoresistive film; **but fails to show** that the first and second non-metallic intermediate layers has a

structure in which a columnar conductive phase is formed in an insulating phase formed of an oxide, an oxynitride or a nitride.

- Applicant asserts: the present invention is to provide a magnetoresistive element of a high sensitivity adaptable to the high magnetic recording density required in the future, which has a low interlayer coupling field and a high breakdown voltage while maintaining appropriate resistance and a high MR ratio, a magnetic head using the particular magnetoresistive element and a magnetic reproducing apparatus using the particular magnetic head.

Conclusion

5. The prior art made of record in PTO-892 Form and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tianjie Chen whose telephone number is 571-272-7570. The examiner can normally be reached on 8:00-4:30, Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa Nguyen can be reached on 571-272-7579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Chen Tianjie

TIANJIE CHEN
PRIMARY EXAMINER